PROGRAM facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Gas Exploration, Production, and Storage

04/2003

CONTACT POINTS

Brad Tomer
Product Manager
Gas Exploration, Production, and Storage
304-285-4692
brad.tomer@netl.doe.gov

Charles M. Zeh
Division Director
Gas Supply Projects
304-285-4265
charles.zeh@netl.doe.gov

Joseph Renk
Project Manager
412-386-6406
joseph.renk@netl.doe.gov

STRATEGIC CENTER FOR NATURAL GAS WEBSITE

www.netl.doe.gov/scng

METHANE HYDRATES

Over the past three decades, expeditions to polar regions and deep-water continental shelves all over the globe have confirmed the existence of vast deposits of naturally-occurring methane hydrate. Today, the United States Geological Survey estimates that these deposits may contain more organic carbon than all the world's coal, oil, and non-hydrate natural gas *combined*. The apparent size of this previously unknown storehouse of methane is truly staggering and has raised serious inquiry into the potential of utilizing the methane stored in hydrates as a future energy source. Spurred by this potential, nations all over the globe have begun significant methane hydrate R&D programs.

However, the issues surrounding methane hydrates go well beyond its energy resource potential. As field and laboratory studies supported by the Methane Hydrates Program continue to document hydrate's integral and active role in the global environment, important new questions are raised about the adequacy of our current understanding of the global carbon cycle, the evolution of deep sea life, sea-floor stability, and other phenomena. In addition, the inherent instability of hydrates is increasingly posing a hazard to the safety of drilling and producing oil and natural gas from underlying conventional accumulations in deep-water settings. Therefore, *the National Methane Hydrate R&D Program is driven by the need to better understand the nature of hydrates, hydrate-laden sediments, and the interaction between the global methane hydrate reservoir and the world's oceans and atmosphere as a prelude to the ultimate realization of hydrates immense energy potential.*

Clearly, no one organization has the expertise and resources to efficiently answer the urgent questions surrounding methane hydrates. Therefore, the National Methane Hydrate Program, representing a new model for collaborative R&D among the nation's leading research institutions, was formed. Coordinated by DOE's National Energy Technology Laboratory, scientists from DOE's network of Industrial Partners and National Laboratories, the Naval Research Lab (NRL), the United States Geological Survey (USGS), the Minerals Management Service (MMS), the National Oceanographic and Atmospheric Administration (NOAA) and the National Science Foundation (NSF), are working to provide the knowledge and technologies to allow the full realization of methane hydrate's potential in supporting our nation's continued economic growth, energy security, and environmental protection.

Over the past two decades, the primary focus of hydrate research has been *improved characterization* through lab studies of man made hydrates. Fundamental questions such as quantities, distributions, modes of occurrence, physical and chemical properties, and many others, are increasingly being answered. Today, the focus has

Methane is actively dissociating from a hydrate mound on the Gulf of Mexico deep sea floor.

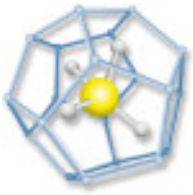
METHANE HYDRATES

shifted to the recovery and study of naturally occurring hydrate samples. These data are allowing the refinement of predictive computer models that will accurately predict the behavior of hydrates and hydrate-sediment systems to a variety of changes in conditions. Currently, there are several projects focused on using the huge natural laboratories found in Alaska and the Gulf of Mexico. Some of these projects are listed below:

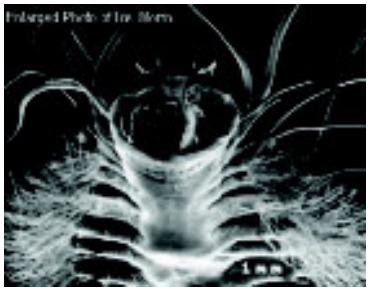
- The drilling of the nation's first dedicated methane hydrate well on Alaska's North Slope by Maurer Technology Inc., Anadarko Petroleum Corporation, and Noble Drilling. This well was also the first to be drilled from a unique elevated drilling platform designed to protect the Arctic tundra.
- Regional characterization of northern Alaska hydrates in association with British Petroleum, the Universities of Alaska and Arizona, and the USGS. The project's goal is to provide improved tools for geologic and engineering modeling of hydrate deposits.
- Work with several industry partners involved in a Joint Industry Project led by ChevronTexaco to provide detailed information on selected hydrates accumulations in the deep water Gulf of Mexico. This work is focused on understanding and avoiding the hazards involved in drilling and producing oil and gas through or near hydrate-bearing sediments.
- The installation of a permanent monitoring station on the floor of the Gulf of Mexico. The station, operated by a consortium of researchers coordinated through the Center for Marine Resources and Environmental Technology at the University of Mississippi will provide information on ongoing, natural processes of hydrate formation and decomposition.

As these and other ongoing projects provide new information and analytical tools, our improving understanding of natural methane hydrates will be brought to bear on four broad groups of issues:

- the *role hydrate plays in global processes* such as climate and the carbon cycle.
- *hydrates as a natural part of deep-sea environments*, including its connection to sea-floor stability and deep-sea life.
- *assuring the safety of deep-water oil and gas E&P operations* that increasingly require drilling through overlying marine hydrate deposits, and
- ensuring the long-term supply of natural gas *by developing the knowledge and technology base to allow commercial production of methane from domestic hydrate deposits by the year 2015*.

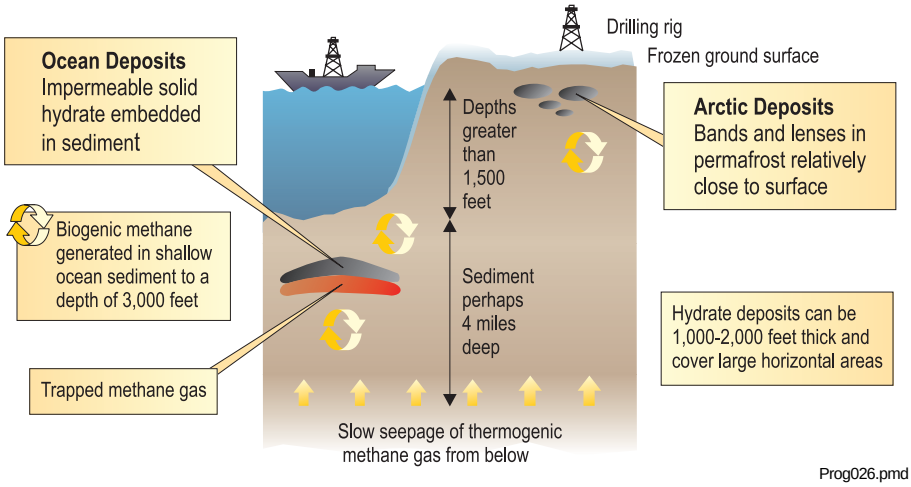


Discrete samples of gas hydrates are collected from Gulf of Mexico seeps using a mini-drill and a gas hydrate recovery chamber deployed from the submersible Johnson Sea Link.



New species of polychaete worm found living in gas hydrates during a NOAA/NURP-sponsored sub cruise in 1997 on the northern Gulf of Mexico continental slope at a depth of 549 m (1,800 ft).

Types of Methane Hydrate Deposits



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ADDRESS

National Energy Technology Laboratory

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880
304-285-4469 fax

626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940
412-386-4604 fax